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Abstract

This paper examines the overall cost of the scientific scholarly journal system and finds that the relative system costs have not increased since the late 1970s. Why then have journal prices skyrocketed over this same period? We first describe typical scholarly publishing costs, because to understand journal prices one must understand the factors that affect these costs. We then describe some factors that have likely contributed to spiraling price increases and changes in journal subscription demand. Finally, we discuss some alternative pricing policies that might help in the future. This paper summarizes results reported in a recent book: *Towards Electronic Journals: Realities for Scientists, Librarians, and Publishers* by the authors (Tenopir & King, 2000). Results are based on 13,591 readership survey responses from scientists, over 100 economic cost studies, tracking of 715 journals from 1960 to 1995, and review of over 800 publications.

SCIENTIFIC JOURNAL SYSTEM COSTS

During the 1970s King Research performed a number of studies of scientific communication under contract to the National Science Foundation (King & Roderer, 1978; King, McDonald & Roderer, 1981). One of these studies involved a systems analysis of the scientific scholarly journal system, including the identification and characterization of all principal functions and related activities performed in the journal system. It also involved an analysis of participants who performed the functions, including scientists as authors, referees and readers; publishers; and libraries and other intermediary organizations. For each of the hundreds of activities, we established quantities of output and the amount of resources required to perform the activities where resources included peoples' time, equipment, facilities, paper, and so on. We determined a dollar amount for the resources applied across the system and found that the overall system costs summed to $4.7 billion in 1977 (or about $16.4 billion in current dollars considering increases in costs). This $16.4 billion translates into about $5,900 per scientist, or $65 per reading of articles.

In 1998 the total system costs are estimated to be about $45 billion. Of the $45 billion, about 87 percent is attributable to scientists' time authoring, obtaining articles and reading them. Publishing costs account for seven percent of total costs and libraries and other intermediary services contribute to six percent of the costs. It is noted that the $45 billion includes the sum of all resources applied by the participants such as peoples' time, equipment, facilities, and so on. It does not include exchange of money such as the price paid by libraries and scientists for subscriptions, separate copies of articles, etc., because the prices and costs of resources leading to prices would represent a duplication of resource costs in the overall journal system.

In 1998 the relative system costs came to $7,200 per scientist and about $60 per reading. The scientists' cost per reading increased some from 1977 to 1998 because they spend more time obtaining articles and reading them. The cost of obtaining articles has gone up some because much more reading is from library-provided journals than in the past. In fact, the proportion of readings from this source in 1977 was 15 percent, but has gone to 55 percent in recent years because scientists have reduced personal subscriptions from 5.8 to 2.7 personal subscriptions per scientist. Average reading costs have increased because the time spent per reading has increased from 45 minutes per article read to 52 minutes. This is due in part to an increase in size of articles.

On the other hand, library resource costs per reading are down somewhat because of better services and there is more reading per journal subscribed (keeping in mind that price is not included in library resources applied). Publishing cost per reading is down because there is more reading per article now than in 1977. However, the

publishing cost per scientist is also down because there are about three fewer subscriptions per scientist now than in 1977. On balance, the average resource cost to libraries and publishers per scientist and per reading have both decreased since 1977. Then, one must ask, why have average journal prices increased by a factor of nearly ten times over a period of time in which the relative cost of publishing has actually decreased?

TO UNDERSTAND PRICE ONE MUST UNDERSTAND PUBLISHING COSTS

In order to understand publishing costs we developed a cost model from the systems study mentioned above complemented with secondary sources of cost data. The model actually involves five components: article processing (i.e., manuscript processing, review and editing, composition, etc.); non-article processing (i.e., covers, table of contents, letters, book reviews, etc.); reproduction (i.e., printing, binding, etc.); distribution (i.e., labeling, wrapping, mailing, etc.); and support (i.e., administration, marketing, financing, legal aspects, etc.). The model includes a dozen parameters that affect cost, such as number of manuscripts submitted, articles published, issues, pages, special graphics, circulation (i.e., number of subscriptions), and so on. Using average journal parameters (e.g., 123 articles per title, 1,700 pages per year, 8 issues, 5,800 subscribers, etc.), the model yields an estimated cost of $560,000 per title. The model is used to demonstrate the dynamics of publishing costs. One can hold all but one parameter constant and determine the effect of varying the one parameter. For example, one can hold all parameters constant and determine how the number of subscriptions affects total costs and cost per subscriptions (i.e., the minimum price necessary to recover costs). One can also compare costs over time when the parameters change.

Holding all parameters constant but number of subscriptions, we find that average costs per subscription are as follows:

Subscriptions	Cost per Subscriptions
500	$775
1,000	$404
5,000	$107
10,000	$70

There is an eleven-fold difference in costs between journals having 500 subscriptions and 10,000 subscriptions when all other parameters are held constant. It is noted, however, that in reality large subscription journals tend to have different costs than low subscription journals. Editorial costs tend to be higher, there are more special graphics, higher quality paper is used, and so on. The model does, however, show the importance of number of subscriptions to the cost per subscription and, therefore, price of journals.

It is noted that the model has a total cost of $560,000 for a "typical" journal with 5,800 subscriptions. Thus, the average cost of this journal is about $96 per subscription which is substantially less than the average price per title. The reason for this is that the average price per title is found by averaging prices of journals; that is, the sum of prices of a set of journals divided by the number of journals in the set observed. The average cost/price per subscription is substantially less because the probability distribution of subscriptions is highly skewed. That is, there are many small subscription journals (at a high price) and a few very large subscription journals, some in the hundreds of thousands subscriptions. The large circulation journals dominate the averages. This phenomenon is demonstrated by examining quartiles of journals as follows:

No. of Titles	Circulating Range	Average Circulation	Cost per Subscription
1,700	150-900	520	$747
1,700	901-1,900	1,310	$316
1,700	1,901-5,700	3,290	$145
1,700	5,701+	18,100	$53

There are about 6,800 scientific scholarly journals published in the U.S. with the above average circulation and average cost per subscription (holding all but the circulation parameter constant). The total number of subscriptions is roughly estimated by multiplying number of titles times average circulation. This is found to be 39.47 million total subscriptions for these 6,800 journals. The total cost/price of all these subscriptions is found by cross-

multiplying number of titles, average circulation and cost per subscription. This comes to about $3.8 billion, which divided by the total number of subscriptions comes to about $96 per subscriptions. On the other hand, the average cost/price per title is found by multiplying the number of titles times average cost/price and dividing by 6,800 (or since the example involves quartiles, just summing average cost/price and dividing by four). This comes to $315 per title, which is substantially higher than the average cost/price per subscription ($96).

REASONS JOURNAL PRICES HAVE SPIRALED UPWARD

There is little doubt that prices of scientific scholarly journals have skyrocketed. Average rates of annual increases (per title) were about four percent in the 1960s and have steadily increased to about eight percent recently. From 1975 to 1998 the increase of the price per title has been nearly ten-fold. Some reasons for this phenomenon are explainable. For example, inflation and an increase in the size of journals is estimated to account for about 56 percent of the increase. Another reason is that personal subscriptions began to decrease dramatically in the late 1970s due to a number of factors. In fact, the average number of personal subscriptions per scientist decreased from 5.8 subscriptions to 2.7 recently. Had the average remained at 5.8 subscriptions with the current number of scientists, there would be over 10 million more personal subscriptions than there now are. This means that publishers have lost billions in potential revenue from personal subscriptions that they have attempted to recover through accelerated increases in price to the less price sensitive library market.

While the average circulation per journal decreased only 6,100 subscriptions per title to 5,800 subscriptions, the median decreased from 2,900 to 1,900 subscriptions. Thus, in terms of circulation, the "rich are getting richer and the poor poorer." There are two reasons for this shift. First, new journals tend to have low circulation and the number of journals increased from 4,400 in 1975 to 6,800 recently. The new journals are also observed to increase circulation more slowly than in the past. The probability distribution of circulation has shifted somewhat since 1997 as shown below:

Circulation Range	Proportion of Titles	
	1977	1995
150-900	20%	25%
901-1,900	18%	25%
1,901-5,700	35%	25%
5,701+	27%	25%

Applying the cost model, we find that the shift in circulation probability distribution might account for a 15 percent price differential.

The second reason is that once circulation begins to decrease below about 2,500 subscriptions, the required price necessary to recover cost begins to accelerate. This phenomenon is demonstrated below, again using the cost model, by showing the additional cost/price required when circulation drops by 100 subscriptions:

Circulation Decrease	Required Increase in Cost/Price
2,500 to 2,400	$6
2,000 to 1,900	$8
1,500 to 1,400	$18
1,000 to 900	$41
500 to 400	$186

One can see how circulation decreases affect price in an accelerated manner since higher prices result in decreased circulation, requiring even higher prices, and so on.

These reasons do not explain all the increase in price. Some, particularly librarians, have speculated that commercial publishers are making an exorbitant profit through the increased prices, although this has yet to be clearly shown and the net revenue for some society and non-profit publishers has also increased substantially. Another assertion is that the increased size of publishers (i.e., number of journals published per publisher) has a bearing on price increases.

McCabe (1998) has provided evidence that such growth results in higher prices of journals. The trend in growth in publisher size is due to newly started journals, particularly commercial publishers. However, growth through merger has been a particularly important factor in this growth.

FACTORS AFFECTING DEMAND/CIRCULATION

Price is an extremely important factor in the extent to which journals are purchased. However, another equally important factor is the inherent size of the audience served by a journal. Many of the new journals are highly specialized and, as such, can only expect a small circulation. Attributes of the journals also determine demand. Clearly, scientists will read journals more often depending on their quality, speed of publishing, comprehensiveness and relevance of articles covered, as well as the reputation of authors. Also, cost in scientists' time, and their effort required to obtain alternative sources of information play a major part in purchase and use of scientific scholarly journals. Scientists and libraries can choose from many channels of information and from several journal distribution means, including personal subscriptions, library subscriptions, and separate copies of articles such as preprints, reprints, interlibrary loans and document delivery, and copies provided by colleagues, authors and others. These and other types of alternative sources of information are what make the system work.

SOME ALTERNATIVE PRICING POLICIES

Future pricing policies may be more important to the journal system than new technology. Some suggested alternatives include: site licenses, further price differentiation (Varian, 1998), providing readers with debit accounts (Getz, 1999), and renewed ways of recovering article-processing costs (Harnad, 1995). All of these alternatives have merit and should be explored carefully. Yet, the important journal system should not be changed merely for the sake of change.

REFERENCES

Getz, M. (1999). "Academic publishing: Networks and prices." In H.A. Thompson (Ed.), *Conference Proceedings, ACRL Ninth National Conference*, 13-27. Chicago: ACRL.

Harnad, S. (1998). On-line Journals and Financial Fire-walls. *Nature*, 395, 127-128.

King, D.W., McDonald, D.D., & Roderer, N.K. (1981). *Scientific journals in the United States: Their production, use, and economics*. Stroudsburg, Penn.: Hutchinson Ross Publishing Company, dwking@umich.edu.

King, D.W. & Roderer, N.K. (1978). *Systems analysis of scientific and technical communication in the United States: The electronic alternative to communication through paper-based journals*. Washington, D.C.: King Research. Available from NTIS PB 281-847.

McCabe, M.J. (1998). *The impact of publisher mergers on journal prices: A preliminary report*. Washington, D.C. Association of Research Libraries. Available from <http://www.arl.org/newsltr/200/mccabe.html>.

Tenopir, C. & King, D.W. (2000). *Towards electronic journals: Realities for scientists, librarians, and publishers*. Washington, D.C.: Special Libraries Association.

Varian, H.R. (1995). The information economy. How much will two bits be worth in the digital marketplace? *Scientific American*, September, 200-01.